भारतीय मानक
Indian Standard

IS 17218 : 2019

छत के ऊपरी भाग को ठंडा रखने के लिये सौर ताप के परावर्तन हेतु बाहरी कोटिंग

Solar Thermo-Reflective Exterior Coating for Cooling of Roof Top

ICS 87.020

© BIS 2019

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

August 2019 **Price Group 3**

Paints, Varnishes and Related Products Sectional Committee, CHD 20

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints, Varnishes and Related Products Sectional Committee had been approved by the Chemical Division Council.

This standard has been developed for the product solar thermo-reflective exterior coating for cooling of roof top. The main feature of such coating is to reflect substantial part of heat producing infra-red aspect of sun's scorching rays and coating can be applied on both metal and concrete surfaces. These coatings have high heat reflectivity and poor thermal conductivity resultant to reduced heat transfer to substrate, thereby increasing human comfort. It is reported that these coating reduces power consumption of air conditioner up to 40 percent. Product does not require additional curing after application.

In this standard, lead restriction up to a maximum permissible limit of 90 ppm and toxic heavy metals restriction as 0.1 percent maximum has been prescribed to avoid hazardous impact of lead and toxic heavy metal exposure and consequent adverse impact on environment and human health. Further, majority of consumers are not aware of the consequences of prescribing of lead and other heavy metal toxicity and its long-term implications to human health. Therefore, along with lead and toxic heavy metal restriction, a suitable cautionary notice has also been prescribed in the marking clause.

This standard was formulated by CHD 20 technical committee. The list of experts who made significant contribution to the formulation of this standard is given at Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SOLAR THERMO-REFLECTIVE EXTERIOR COATING FOR COOLING OF ROOF TOP

1 SCOPE

This standard prescribes requirements, sampling and methods of test for solar thermo-reflective exterior coating for cooling of roof top used to bring down the temperature of roof top. Solar thermo-reflective exterior coating for cooling of roof top can be applied on concrete roof top or steel roof top for the purpose of imparting relief to the inhabitants in a normal house and reduce electricity consumption.

2 REFERENCES

The standards listed in Annex A contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards given in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1303 and following shall apply.

3.1 Solar Reflectance Index (SRI) — The Solar Reflectance Index (SRI) is a measure of the solar reflectance and emissivity of materials that can be used as an indicator of increase in temperature when solar radiation is incident on their surface. Lower the SRI, the hotter a material is likely to become in the sunshine.

4 CLASSIFICATION

The product shall be of following types based on application:

4.1 Emulsion Paint

Suitable for use on concrete surface. It is single component, ready for application system.

4.2 Solvent Based Paint

Suitable for use on metal surface. It is two component system:

a) Base, and
b) Hardener.

Base and hardener shall be mixed as recommended by manufacturer before the application.

NOTE — Mix base and hardener separately to re-disperse any settling or separation before mixing them (v/v).

5 REQUIREMENTS

5.1 Description

The product shall be liquid, suitable for application by brush, roller and airless spray, free from lumps and grittiness.

5.2 Lead Restriction

The material shall be tested for restriction of lead in accordance with IS 101 (Part 8/Sec 5). When thus tested, the material shall not contain lead or compounds of lead or mixtures of both, calculated as metallic lead, exceeding 90 ppm.

5.3 Toxic Heavy Metal Restriction

Product shall not be manufactured using mercury and mercury compounds, cadmium, chromium VI, arsenic, antimony and their oxides. The material shall not contain more than 0.1 percent by weight in total of above toxic heavy metals in the form of natural impurities or impurities entailed by the production process which are contained in the raw material when tested by the relevant Atomic Absorption Spectroscopic (AAS) methods.

5.4 The material shall also comply with the requirements given in Table 1.

6 PACKING AND MARKING

6.1 Packing

Unless otherwise agreed to between the purchaser and the supplier, the enamel shall be packed in suitable metal containers (*see* IS 1407 and IS 2552). The packing is subject to the provisions of the law in force in the country at that time.

6.2 Marking

6.2.1 Each container shall be marked with the following:

a) Name and type of material;
b) Name of manufacturer;
c) Lead content (*Max*);
d) Toxic heavy metals content (*Max*);
e) Volume of the material;

f) Batch number or lot number in code or otherwise;
g) Month and year of manufacture;
h) Colour/shade of the material; and
j) A cautionary note as given below:
    1) Keep out of reach of children.
    2) Dried film of this paint may be harmful if eaten or chewed.
    3) This product may be harmful if swallowed or inhaled.

6.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

7 SAMPLING

7.1 Preparation of Test Samples

7.1.1 *For Registration*

The sample shall be submitted in three different containers each containing not less than 500 ml of the material.

7.1.2 *Bulk Supply Sample*

Representative samples of the materials shall be drawn and treated as prescribed in IS 101 (Part l/Sec 1).

7.1.3 *For Drying Time Test*

Prepare mild steel panel of sizes 150 mm × 100 mm × 1.25 mm as prescribed in **2** of IS 101 (Part 1/Sec 3) and concrete panel of size 150 mm × 150 mm × 12.5 mm as prescribed in **7** of IS 101 (Part 1/Sec 3). Apply the

Table 1 Requirement for Solar Thermo-Reflective Exterior Coating for Cooling of Roof Top for Roof Top

(*Clause* 5.4)

Sl No.	Characteristic	Requirement		Method of Test
		Emulsion Paints	Solvent Based Paint	
(1)	(2)	(3)	(4)	(5)
i)	Drying time, *Max*			IS 101 (Part 3/Sec 1)
	a) Surface dry	30 min	2 h	
	b) Hard dry	3 h	12 h	
	c) Tack free	4 Days	7 Days	
ii)	Mass, kg/10 litre, *Min*	13	12.5	IS 101 (Part l/Sec 7)
iii)	a) Consistency	Smooth, uniform and suitable for brushing without appreciable drag on the brush		Annex C of IS 133
	b) Viscosity, sec, in No. 4 Ford Cup at 27 ± 2°C	← 80 to 120 →		IS 101 (Part 1/Sec 5)
iv)	a) Finish	Matt	Glossy	IS 101 (Part 3/Sec 4)
	b) Gloss, 60°	—	50-60	IS 101 (Part 4/Sec 4)
v)	Volume Solids, percent, *Min*	← 47 →		IS 101 (Part 8/Sec 6)
vi)	Colour	Close match to the specified IS colour as in IS 5 or to an agreed colour		IS 101 (Part 4/Sec 2)
vii)	Thickness, dry film, microns, *Min*	120	120	Annex A of IS 16676
viii)	Solar reflectance index, *Min*	102	102	ASTM E 1980-11
	a) Reflectance, *Min*	80 percent	80 percent	ISO 9050
	b) Emissivity, *Min*	0.92	0.92	EN 673
ix)	Pull off adhesion, *Min*	2.8 MPa	7.2 MPa	Annex D of IS 16676
x)	Hardness (pencil), *Min*	3h	5h	IS 101 (Part 5/sec 1)
xi)	Pot life at 30°C, *Min*	—	3 h	Annex J of IS 5410
xii)	Accelerated weatherometer test, 2 000 h exposure	Gloss retention and colour fastness shall be minimum 90percent of original.	Gloss retention and colour fastness shall be minimum 95 percent of original.	IS 101 (Part 6 / Sec 5)

paint uniformly on each side of the panel by brushing to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/Sec 4).

7.2 Criteria for Conformity

A lot shall be declared as conforming to the requirements of this standard, if the test results of the composite sample satisfy the requirements given in **5**.

8 TEST METHODS

8.1 Tests shall be conducted as prescribed in **5.2** to **5.4** and the test methods referred in col 5 of Table 1.

8.2 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

(*Clause* 2)

LIST OF REFFERED INDIAN STANDARDS

Indian Standard	*Title*
101 (Part 1/Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 1 Sampling
101 (Part 1/Sec 3) : 1986	Methods of sampling and test for paints varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 3 Preparation of panels
101 (Part 1/Sec 5) : 1989	Methods of sampling and test for paints varnishes and related products: Part 1 Tests on liquid paints (general and physical), Section 5 Consistency
101 (Part 1/Sec 7) : 1987	Methods of sampling and test for paints, varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 7 Mass per 10 litres
101 (Part 3/Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 3 Tests on paint film formation, Section 1 Drying time
101 (Part 3/Sec 4) : 1987	Methods of sampling and test for paints varnishes and related products: Part 3 Tests on paint film formation, Section 4 Finish
101 (Part 4/Sec 2) : 1989	Methods of sampling and test for paints varnishes and related products: Part 4 Optical test, Section 2 Colour
101 (Part 4/Sec 4) : 1988	Methods of sampling and test for paints varnishes and related products: Part 4 Optical test, Section 4 Gloss
101 (Part 5/Sec 1) : 1988	Methods of sampling and test for paints varnishes and related products: Part 5 Mechanical test on paint films, Section 1 Hardness tests
101 (Part 6/Sec 5) : 1997	Method of sampling and test for paints varnishes and related products: Part 6 Durability test on paint films, Section 5 Accelerated weathering test
101 (Part 8/Sec 5) : 1993	Methods of sampling and test for paints varnishes and related products: Part 8 Tests for pigments and other solids, Section 5 Lead restriction test
101 (Part 8/Sec 6) : 1996	Methods of sampling and test for paints varnishes and related products: Part 8 Tests for pigments and other solids, Section 5 Volume solids
133 : 2013	Enamel interior (a) undercoating (b) finishing — Specification
1070 : 1992	Reagent grade water
1303 : 1983	Glossary of terms relating to paints
1407 : 1980	Round paint tins
2552 : 1989	Steel drums (galvanized and ungalvanized)
5410 : 2013	Cement aint — Specification
16676 : 2017	Solventless liquid epoxy system for application on interior and exterior surfaces of steel water pipeline specification
EN 673 : 2011	Glass in building. Determination of thermal transmittance (U value). Calculation method
ASTM E 1980-11	Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
ISO 9050 : 2003	Glass in building — Determination of light transmittance, solar direct transmittance, total solar energy transmittance, ultraviolet transmittance and related glazing factors

ANNEX B

(*Foreword*)

EXPERTS WHO MADE SIGNIFICANT CONTRIBUTION TO THE DEVELOPMENT OF THIS STANDARD

Organization	*Representative(s)*
In personal capacity	Dr Sunil Kr. Saha (***Chairman***, CHD 20)
In personal capacity	Prof A. S. Khanna (*Rtd from IIT Bombay*)
Asian Paints Ltd	Dr Randhirsinh Parmar
Berger Paints India Ltd	Dr Tapan Dhar Shri Swagata Chakraborty (*Alternate*)
Central Building Research Institute	Dr P. C. Thapliyal
Institute of Chemical Technology, Mumbai	Dr Anagha Sabnis
J K White Cement	Dr Tripti Jain Shri K. N. Pandey (*Alternate* I) Shri D. D. Purohit (*Alternate* II)
Meta-Chem Paints and Adhesives Pvt Ltd	Dr B. Panja
Paint and Coating Technologists Association	Shri Umesh Chandra Shri Vivek Kumar Saxena (*Alternate*)
Pidilite Industries Ltd	Shri Ajay Kohli Shri Ramesh Kashyap (*Alternate*)
QACM Kanpur	Dr Gurbachan Singh
SSPC India Chapter, Kolkata	Dr Buddhadeb Duari
Directorate General, BIS	Shri U. K. Das, Scientist 'E' and Head (CHD) [Representing Director General (*Ex-officio*)]

Member Secretary

Shrishti Dixit
Scientist 'C' (CHD), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: CHD 20 (13722).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices: *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002 { 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi
KOLKATA 700054 { 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg
CHANDIGARH 160019 { 265 0206, 265 0290

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 { 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400093 { 2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi